

FOOD SECURITY AND CLIMATE CHANGE

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ABSTRACT

Food security refers to the availability of food and one's access to it. A household is considered food-secure when its occupants do not live in hunger or fear of starvation. According to the World Resources Institute, global per capita food production has been increasing substantially for the past several decades.

In 2006, MSNBC reported that globally, the number of people who are overweight has surpassed the number who are undernourished - the world had more than one billion people who were overweight, and an estimated 800 million who were undernourished. According to a 2004 article from the BBC, China, the world's most populous country, is suffering from an obesity epidemic. In India, the second-most populous country in the world, 30 million people have been added to the ranks of the hungry since the mid-1990s and 46% of children are underweight.

In developing countries, often 70% or more of the population lives in rural areas. In that context, agricultural development among smallholder farmers and landless people provides a livelihood for people allowing them the opportunity to stay in their communities. In many areas of the world, land ownership is not available, thus, people who want or need to farm to make a living have little incentive to improve the land.

Climate change may affect food systems in several ways ranging from direct effects on crop production (e.g. changes in rainfall leading to drought or flooding, or warmer or cooler temperatures leading to changes in the length of growing season), to changes in markets, food prices and supply chain infrastructure. The relative importance of climate change for food security differs between regions. For example, in southern Africa, climate is among the most frequently cited drivers of food insecurity because it acts both as an underlying, ongoing issue and as a short-lived shock.

The low ability to cope with shocks and to mitigate long-term stresses means that coping strategies that might be available in other regions are unavailable or inappropriate. In other regions, though, such as parts of the Indo-Gangetic Plain of India, other drivers, such as labour issues and the availability and quality of ground water for irrigation, rank higher than the direct effects of climate change as factors influencing food security.

Climate change may affect the food security system in many ways.

- Climate change will act as a multiplier of existing threats to food security: By 2050, the risk of hunger is projected to increase by 10 – 20 %, and child malnutrition is anticipated to be 20 % higher compared to a no-climate change scenario.
- Achieving food security under a changing climate requires substantial increases in food production on the one hand, as well as improved access to adequate and nutritious food and capacities to cope with the risks posed by climate change on the other hand.
- Governments must be assisted in enhancing food production and access, scaling up social protection systems and improving their ability to prepare for and respond to disasters.

- Community-based development processes need to be fostered in order to enable the poorest and most vulnerable to build sustainable and climate resilient livelihoods and move out of chronic poverty and food insecurity.
- The humanitarian community must get prepared for more extreme weather events and protecting the already food insecure better by strengthening both crisis response and crisis prevention.

KEYWORDS: Food Security, Climate Change, Food Availability, Food Accessibility, Food Utilization

INTRODUCTION

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In developing countries, often 70% or more of the population lives in rural areas. In that context, agricultural development among smallholder farmers and landless people provides a livelihood for people allowing them the opportunity to stay in their communities. In many areas of the world, land ownership is not available, thus, people who want or need to farm to make a living have little incentive to improve the land.

Two commonly used definitions of food security come from the UN's Food and Agriculture Organization (FAO) and the United States Department of Agriculture (USDA):

- Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.
- Food security for a household means access by all members at all times to enough food for an active, healthy life. Food security includes at a minimum (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies). (USDA)

CLIMATE CHANGE

Climate change is a long-term shift in the climate of a specific location, region or planet. The shift is measured by changes in features associated with average weather, such as temperature, wind patterns and precipitation. What most people don't know is that a change in the variability of climate is also considered climate change, even if average weather conditions remain the same.

Climate change occurs when the climate of a specific area or planet is altered between two different periods of time. This usually occurs when something changes the total amount of the sun's energy absorbed by the earth's atmosphere and surface. It also happens when something changes the amount of heat energy from the earth's surface and atmosphere that escapes to space over an extended period of time.

CLIMATE CHANGE AND FOOD SECURITY

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According to the analysis, it is this equation of climate change and its impacts on food production plus increased population growth that would result in a deficit of global food production versus demand, which could increase by 100 million the number of undernourished women and children by 2020. Food security will be one of the main issues to be discussed at both the Group of 20 (G20) and the United Nations Conference on Sustainable Development (Rio+20) meetings in mid-June.

Where we are?

"India is ranked 66 in the list of 105 countries, scoring slightly higher in the category of 'availability' than in other two categories of 'affordability' and 'quality and safety'," US-based DuPont Executive Vice President James C Borel said after the launch of the index.

Although India's food security level is lower than China (ranked 39) and Sri Lanka (62), it is much better than Pakistan (75) and Bangladesh (81), the index findings showed.

High level of poverty, lower income, less public spending on farm research, poor infrastructure, sluggish supply of quality protein are some of the key challenges that India need to address, it noted.

However, presence of food safety net programmes and access to farm credit has helped the country achieve some level of food security, it added.

The 2012 Global Food Security Index, developed by the Economicst Intelligence Unit (EIU) and commissioned by DuPont, ranks 105 countries in accordance to their relative level of food security in three categories -- affordability, availability and quality and safety.

According to EIU regional Director Pratiba Thaker, "Apart from the challenges of availability and accessibility as reflected in chronic household food insecurity, India also faces a nutrition challenge. India's nutrition level is lower than the neighbouring Pakistan due to large percentage of population being vegetarian."

Highlighting the importance of the Food Security Index, DuPont South Asia President Rajeev Vaidya said: "It should be used as a tool to help stakeholders make informed decisions that drive sustainable results at a local level." The company called for local collaborations and science-powered innovations to address the challenge of the country's food security.

To address global food security challenge, DuPont also announced investment of USD 10 billion in farm research and development and advancing 4,000 new products by 2020. DuPont offers across a variety of market segments

including agriculture, food and nutrition, healthcare, home and construction, transportation, renewable energy and infrastructure.

FOOD SECURITY IN A CHANGING CLIMATE

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- Achieving food security under a changing climate requires substantial increases in food production on the one hand, as well as improved access to adequate and nutritious food and capacities to cope with the risks posed by climate change on the other hand.
- Governments must be assisted in enhancing food production and access, scaling up social protection systems and improving their ability to prepare for and respond to disasters.
- Community-based development processes need to be fostered in order to enable the poorest and most vulnerable to build sustainable and climate resilient livelihoods and move out of chronic poverty and food insecurity.
- The humanitarian community must get prepared for more extreme weather events and protecting the already food insecure better by strengthening both crisis response and crisis prevention.

Selected projected regional impacts of climate change on food production:

In tropical and sub-tropical regions, especially in seasonally dry areas, crop and animal productivity may decrease significantly due to temperature increases of 2 to 3°C. By 2020, climate change could cause, for example:

- Significant decreases in crop yields in some rain-fed African systems;
- Declines of 40 to 90 % of grassland productivity in semi-arid and arid regions;
- High levels of desertification and soil salinization in some areas in Asia, sub-Saharan Africa and Latin America;
- Increasing water stress, particularly in irrigated production systems;
- Increased salinity from sea-level rise, leading to some areas in sub-Saharan Africa and South Asia, such as coastal plains, becoming flooded or unsuitable for agriculture.
- Developing countries are projected to require net import of cereals to increase
- Reduction in cereal production of 10% in developing countries
- A reduction of 2-3% in Africa will put 10 million people at risk
- Number of people at risk of hunger grows by 10-16% or 60-350 million people

Climate Change – A Multiplier of Food Security Risks

Climate change will act as a multiplier of existing threats to food security: It will make natural disasters more frequent and intense, land and water more scarce and difficult to access, and increases in productivity even harder to achieve. The implications for people who are poor and already food insecure and malnourished are immense.

Particularly in the least developed countries and small island developing states, it is the livelihoods and lives of

the poorest and most vulnerable, including women, children and marginal communities, which are also at greatest risk to suffer from the potential impacts of climate change. This is due to their high exposure to natural hazards, their direct dependence on climate sensitive resources such as plants, trees, animals, water and land, and their limited capacity to adapt to and cope with climate change impacts.

Climate change will affect all three dimensions of food security: availability, accessibility, and utilisation.

CLIMATE CHANGE – FOOD AVAILABILITY

It will reduce food availability, because it negatively affects the basic elements of food production – soil, water and biodiversity. Rural communities face increased risks including recurrent crop failure, loss of livestock and reduced availability of fisheries and forest products. Changing temperatures and weather patterns furthermore create conditions for the emergence of new pests and diseases that affect animals, trees and crops. This has direct effects on the quality and quantity of yields as well as the availability and price of food, feed and fibre.

At the same time, more extreme weather events will have serious impacts on livelihood assets in both rural and urban areas and threaten the stability of food supply. Many countries are already dealing with climate change impacts resulting from irregular, unpredictable rainfall patterns, increased incidence of storms and prolonged droughts. Decreasing availability of water and food will also increase sanitation and health problems and increase the risk of diseases and malnutrition. Competition over increasingly scarce resources will also increase the risk of conflicts, displacement and migration, which in turn will again increase the risk of food insecurity.

CLIMATE CHANGE – FOOD ACCESSIBILITY

Reduced food availability due to decreasing yields as a result of climate change has additional direct implications for food accessibility: As food becomes scarce, prices go up and food becomes unaffordable, i.e. inaccessible, for a growing part of the population. The food price spike that peaked in 2008 clearly demonstrated how major fluctuations in global food markets can have far-reaching implications for food security and emergency relief needs. At the same time, the food price spike led to a dramatic increase in the global total of undernourished people by more than 20 % to over a billion in July 2009. Some 125 million children are predicted to be underweight in 2010 if economies do not grow, 5 million more than if progress had continued at the 2007 rate. Even the pre-recession rate of improvement was inadequate to meet the MDG target. While prices fallen overall from the peak levels achieved in 2008, they are expected to remain on average 35 to 60 % higher than in the past decade.

CLIMATE CHANGE – FOOD UTILISATION

As outlined above, even without climate change further increases in food prices are expected. Recent modelling and analysis predicts additional price increases due to climate change for some of the most important agricultural crops – rice, wheat, maize, and soybeans.

To the resulting increases in the number of people at risk of hunger, climate change is projected to add another 10 to 20 % by 2050. Calorie availability in 2050 is likely to have declined relative to 2000 levels throughout the developing world: 24 million additional malnourished children, 21 % more than today, are anticipated – almost half of them, 10 million, in sub-Saharan Africa.

ENSURING FOOD SECURITY IN A CHANGING CLIMATE

There are four main entry points for adaptation and risk reduction strategies aiming at increased food security in

view of climate change. Part of the solution is to increase food availability. Another lies in strategies that ensure that those who are at greatest risk of hunger can actually access and benefit from increased amounts of food and that protect the most vulnerable from the immediate impacts of climate change. This involves improving disaster risk management, enhancing social protection schemes (including the delivery of direct nutrition interventions) and strengthening resilient community-based development.

Increasing Agricultural Productivity, Resilience and Sustainability

Local people are the on-site land managers who play central roles in adapting agriculture⁸ and food systems to meet their needs under changing climate conditions. The concept of adapting to climate impacts is not new to them.

Traditional coping mechanisms will not be sufficient to ensure food security and prevent effects on nutritional status. They must be complemented by the introduction of technical innovations and enabling frameworks. More research is needed on the breeding of new and adapted as well as the preservation of traditional, locally adapted varieties that can tolerate climate variability and are suitable for changed climatic conditions.

Adaptation strategies must also be supported by strong institutions and enabling policy and legal frameworks. Adaptation to climate change can incorporate a range of successfully tested methods and technologies derived from sustainable agriculture and natural resource management and equitable and inclusive rural development approaches, building on the “no-regrets” principle.

Improving Disaster Risk Management

The number of people affected by disasters has more than tripled since the 1990s. In 2007 over 74 million people were victims of humanitarian crisis. As climate change leads progressively towards increased extremes – storms, droughts, and high temperatures – the challenge to the humanitarian community is not only to respond to the crises, but also to be better prepared and to be able to manage the risks more effectively.

Recent approaches that integrate relief and response in long-term risk management have begun to influence the way disaster management programs are planned and financed. In order to enhance community safety and resilience, the complex interactions between longterm risk reduction and short-term response need to be better understood. At the same time, the most vulnerable to food insecurity must be protected from the immediate impacts of climate change now.

Planning appropriate risk reduction and response requires an understanding of risks and vulnerabilities in terms of who are the vulnerable, where they are and why they are vulnerable. There is a need for improved monitoring, information systems and forward looking risk analysis.

As vulnerable people and communities themselves should always be the primary owners and drivers of any actions aimed at increasing their resilience to disasters, it is crucial to directly involve them in planning and implementation of disaster risk reduction.

Moreover, the gaps between sectoral organizations must be bridged in order to share timely and relevant information concerning risks and their management. Enhancing Social Protection Schemes The existing inequities in food security, food safety and nutrition are likely to be further widened by the adverse consequences of climate change. Adapting food production systems has the potential to significantly increase the resilience of poor farmers to changing climate conditions.

Such public actions have large potential to increase resilience to climate change by contributing to breaking

vicious cycles that lead into chronic poverty traps. Droughts, for example, frequently force poor families to sell off productive assets such as livestock; other shocks often lead to families taking children out of school and to reduction in households' food intake, number of meals, restriction of portion sizes, and purchase of less expensive but less nutritious foods – each with immediate and long-term physical and mental consequences for children.

Social protection relevant to food insecurity, climate change and resource scarcity includes cash and in-kind transfers, such as Ethiopia's Productive Safety Net Programme, which transfers cash (and food) during seasonal food insecurity through employment on public works; employment guarantee schemes, which can be used to invest further in climate resilience, for example strengthening embankments or planting trees; Mother and Child Health and Nutrition and School Feeding programs; weather-indexed crop insurance; micro-finance services; as well as emergency food assistance interventions.

Access to formal social protection systems remains very limited in developing countries. At present only 20 % of the world's people have access to formal social protection systems.¹² Financing social protection support is complicated by the fact that safety nets need to be financed in a counter-cyclical manner, given that needs are greatest when economic performance is weakest.

Strengthening Resilient Community-Based Development

Life-saving interventions to protect the food insecure people and their livelihoods from rapid-onset emergencies caused by climatic events are essential. It is equally important, however, to create enabling conditions to ensure that communities affected by disasters are able to build back systems which are better adapted to changing climate conditions.

Supporting a transition towards "climate-smart" relief, rehabilitation and development that improves the livelihoods of low-income farmers and rural people and thereby increases their overall resilience must be considered the basis of adaptation.

Three factors are crucial:

- The prospect of major new investment flows focused on previously neglected lands,
- Incentivizing farmers through investments in agroecological practices and in providing environmental services, and
- Communities influencing policy making and implementation.

CONCLUSIONS

Climate change poses an unprecedented challenge to the aim of eradicating hunger and poverty. In order to meet the growing demand for food security and nutrition under increasingly difficult climatic conditions and in a situation of diminishing resources, the world must urgently move towards embracing a two-fold approach: First, we must invest in and support the development of more efficient, sustainable and resilient food production systems. Second, we must improve access to adequate food and nutrition by the most vulnerable and at risk populations and communities and enhance social protection systems and safety nets as part of the adaptation agenda.

REFERENCES

1. Acemoglu D, Johnson S et al (2001) The colonial origins of comparative development: an empirical investigation. Am Econ Rev 91:1369–1401

2. Banerjee AV, Duflo E (2007) The economic lives of the poor. *J Econ Perspect* 21(1):141–167
3. Bloom DE, Sachs JD (1998) Geography, demography, and economic growth in Africa. *Brookings Pap Econ Act* 2:207–273
4. Bruinsma J (2003) World agriculture: towards 2015/2030: an FAO perspective. *Earthscan*
5. Cassman KG (1999) Ecological intensification of cereal production systems: yield potential, soil quality, and precision agriculture. *Natl Acad Sci* 96:5952–5959
6. Checkley W, Epstein LD et al (2000) Effects of El Niño and ambient temperature on hospital admissions for diarrhoeal diseases in Peruvian children. *Lancet* 355(9202):442–450
7. Davis B, Winters P et al (2007) Rural income generating activities: a cross country comparison. *ESA Working Paper*, Rome, FAO, p 68
8. Kovats RS, Edwards SJ et al (2004) The effect of temperature on food poisoning: a time-series analysis of salmonellosis in ten European countries. *Epidemiol Infect* 132(3):443–453
9. Lobell DB, Burke MB et al (2008) Prioritizing climate change adaptation needs for food security in 2030. *Science* 319(5863):607–610
10. Lopez AD, Mathers CD et al (2006) Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *Lancet* 367(9524):1747–1757
11. Maxwell S, Smith M (1992) Household food security: a conceptual review. In: Maxwell S, Frankenberger T (eds) *Household food security: concepts, indicators, measurements*. IFAD and UNICEF, Rome and New York
12. Schaible UE, Kaufmann SH (2007) Malnutrition and infection: complex mechanisms and global impacts. *PLoS Med* 4(5):e115
13. Singh I, Squire L et al (1986) Agricultural household models: extensions, applications, and policy.
14. Johns Hopkins University Press, Baltimore, Maryland
15. Smith LC, Alderman H et al (2006) Food insecurity in sub-Saharan Africa: new estimates from household expenditure surveys. International Food Policy Research Institute, Washington.
16. Taub DR, Miller B et al (2008) Effects of elevated CO₂ on the protein concentration of food crops: a meta-analysis. *Glob Change Biol* 14(3):565–575
17. Williamson J (1990) What Washington means by policy reform. In: Williamson J (ed) *Latin american adjustment: how much has happened*. Institute for International Economics, Washington, DC